

Shock Absorbing System

Sometimes an aerospace-developed system with clear spinoff potential languishes on the shelf for lack of an immediate application, then is rediscovered years later as advancing technology in other areas creates a need. An example is a lightweight, inexpensive shock-absorbing system developed by Langley Research Center two decades ago, now in service as a safety device for an automated railway at Duke University Medical Center, Durham, North Carolina (below).

In the early days of space flight, NASA was looking for a means of dissipating the energy generated by a

spacecraft landing at excess velocity on Earth, the moon or another planet. Langley's answer was a "frangible"—breakable—metal tube incorporated in the spacecraft's landing leg. If the spacecraft were to hit the surface at a descent rate greater than intended, the impact would shatter the tube; in the process of fragmenting, the tube would absorb energy and reduce the landing shock.

The Transportation Technology Division of Otis Elevator Company, Denver, Colorado found a use for the innovation in the design of Duke's People/Cargo Transportation System. The need for the "people mover" arose when the Medical Center expanded its facilities to include, in addition to the existing hospital, a second





hospital a quarter of a mile distant. The transportation system consists of four electrically-propelled 22-passenger vehicles, like those shown above, which move on a cushion of air along guideways connecting the two hospitals and a parking lot. Carrying patients, visitors, staff and cargo at about 25 miles per hour, the cars stop automatically at terminals in each hospital and in the parking area. At the ends of each guideway are frangible tube "buffers" (right). If a slowing car should fail to make a complete stop at the terminal, it would bump and shatter the tubes, absorbing energy that might otherwise jolt the passengers or damage the vehicle.

Otis Elevator learned of this technology several years ago when, under a NASA grant, Denver Research Institute (DRI) was testing the potential of frangible tubing for such civil applications as elevator or auto bumper shock absorbers; Otis conducted the elevator tests under subcontract with DRI. This experience led to the company's incorporation of the tubular energy absorbers in the Duke system, in lieu of a more complicated and expensive hydraulic device.

